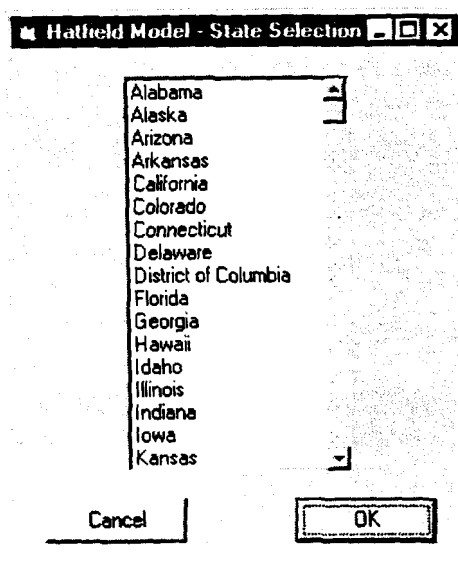


4. Running the Model

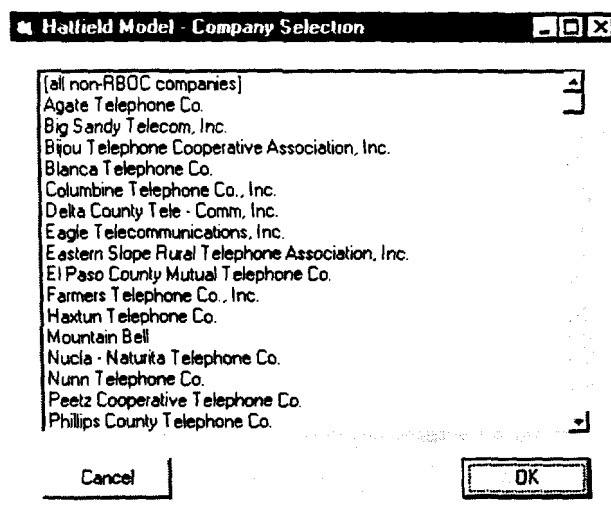
Select State

Running Hatfield Model Release 4.0 is very straightforward. To start the program, click on its icon under the *Programs* entry on the *Start* menu (in Windows 95 or Windows NT 4.0), or the Hatfield Model program group (in Windows NT 3.51). A copyright message will appear, followed by the State Selection form. From this list, select the state you desire to run:



Select Company

After the State is selected, the Company Selection window will appear. This window will contain the names of all companies in the selected state for which Hatfield Model Release 4.0 contains data. Select the appropriate company from this list.



HATFIELD MODEL RELEASE 4.0 MODEL INTERFACE AND AUTMATION DESCRIPTION

If you have not previously run this State/Company combination under this installation of the Hatfield Model Release 4.0, you will be queried as to whether you wish to create a default scenario. You should click on "OK."

Run the Model

After the desired state and company are selected, the main window will appear.

Module	Status
Distribution	Complete
Feeder	Complete
Switching	Complete
Expense	Complete

Run

Summarize By

☒ Density Zone

☐ Wirecenter

☐ CBG

View Expense Results

To run the Model using default user inputs, select either **Density Zone**, **Wirecenter**, or **CBG** level outputs, by clicking on the appropriate button. Click **Run**. The Model will automatically calculate its four modules, then output results (in the Expense Module) in Microsoft Excel.

As each of the modules is calculating, a status bar will display the progress of the calculations. As each module completes, the *Status* indicator will change from *Pending* to *Complete* to indicate that it has calculated successfully.

After a particular Company has been run once, subsequent runs will show the module Status as *Complete* for all modules. To re-run the model click the **Reset** button next to the module from which you would like to restart the Model. For example, to re-run the Expense Module, click **Reset** next to the Expense Module status indicator, and click **Run**.

Hatfield Model Release 4.0 results can be summarized by *Density Zone*, by *Wire Center*, or by *CBG*. Click on the desired option on the main window before clicking **Run**. To see all outputs, first run the Model by *Density Zone* and save the results. Next, select either the *Wirecenter* or *CBG* outputs, click **Reset** next to the Expense module, and then click **Run**. The new output will be displayed.

HATFIELD MODEL RELEASE 4.0
MODEL INTERFACE AND AUTMATION DESCRIPTION

To run the model with customized user inputs, see Section 5.

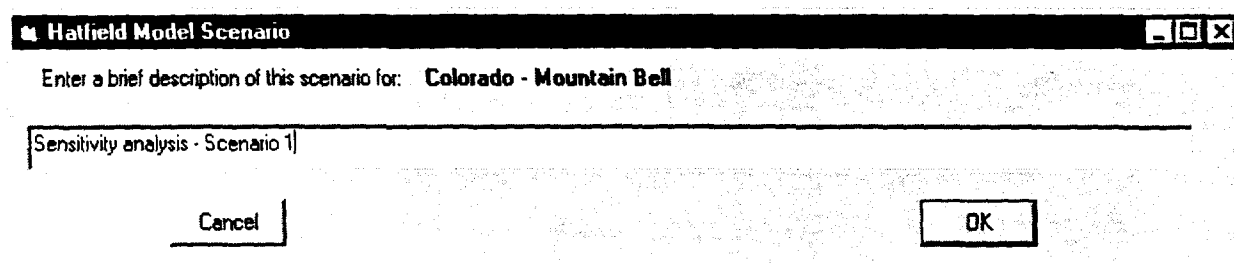
The length of computing time required to execute a run of the Hatfield Model depends both on the number of Census Block Groups (CBGs) in the study area being run, and on the speed of the computer. Using 200 MHz Pentium Pro computer with 64 megabytes of RAM and a fast hard drive, the following performance was obtained.

<i>No. of CBGs</i>	<i>Example Study Areas</i>	<i>Processing Time</i>
1000	NYNEX - NH	5 minutes
3000	US WEST - CO	8 minutes
8000	Ameritech - MI	20 minutes
11000	SWB - TX	30 minutes
16000	PacBell - CA	45 minutes

5. Adjusting User Inputs and Managing Scenarios

Hatfield Model Release 4.0 has over 1200 user adjustable inputs. The Model has input boxes which allow these inputs to be changed easily, and provides a scenario manager to allow users to keep track of various sets of input parameters.

The *Default scenario* in Hatfield Model Release 4.0 cannot be changed through the user interface, so a new scenario must be created before input values can be changed.³ To create a new scenario, select **New HM Scenario** from the **HM Tools** menu. The following input box will appear, prompting for a scenario name. The scenario can have any name up to 100 characters long.



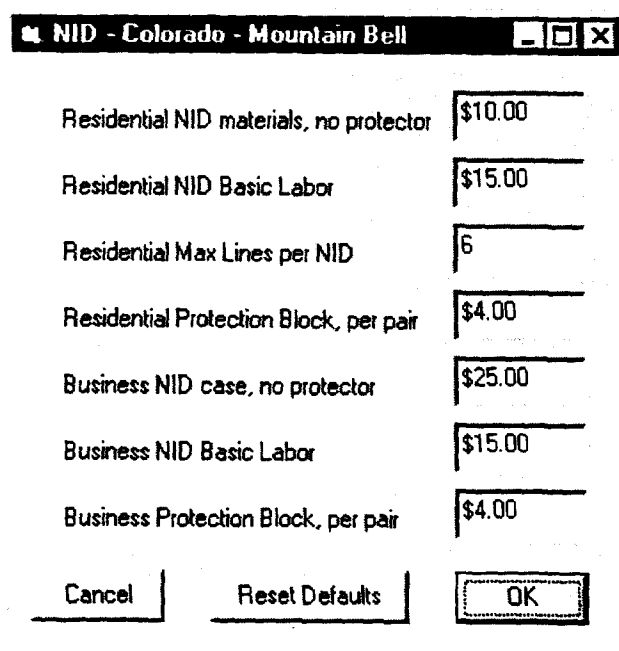
Hatfield Model Scenario

Enter a brief description of this scenario for: Colorado - Mountain Bell

Sensitivity analysis - Scenario 1

Cancel OK

To change a user input, click on **HM Inputs**, then select the appropriate category and sub-category of inputs. An input box will appear:



NID - Colorado - Mountain Bell

Residential NID materials, no protector	\$10.00
Residential NID Basic Labor	\$15.00
Residential Max Lines per NID	6
Residential Protection Block, per pair	\$4.00
Business NID case, no protector	\$25.00
Business NID Basic Labor	\$15.00
Business Protection Block, per pair	\$4.00

Cancel Reset Defaults OK

³ Sophisticated users can alter the specification of the Default Scenario by editing the pertinent input tables in the Microsoft Access database file.

HATFIELD MODEL RELEASE 4.0

MODEL INTERFACE AND AUTMATION DESCRIPTION

Inputs can be changed by simply typing new values in the spaces provided. Clicking **OK** will register the input change, clicking **Reset Defaults** will return each item to its original value, and clicking **Cancel** will close the input box without registering any changes.

Once a scenario has been created, it can be modified incrementally. After the initial scenario is created, choose **Save HM Scenario As...** from the **HM Tools** menu. An input box will appear, prompting for a new scenario name. Give the scenario a new name. The original scenario will be saved, and further changes can be made to the new scenario under its new name.

To return to a previously created scenario, choose **Open HM Scenario** from the **HM Tools** menu. The following selection box will appear, prompting the user to choose a scenario.

ID	Date Created	Description
0	2/4/97 10:05:56 AM	Default Scenario
1	2/4/97 10:43:37 AM	Sensitivity analysis - Scenario 1

Up to 9,999 different scenarios can be stored in the Model for each company. However, each scenario represents hundreds of input values, so the scenario database could become quite large. Scenarios can be deleted when they are no longer needed by selecting **Delete HM Scenario** from the **HM Tools** menu. A selection box will appear which allows scenarios to be deleted.

6. Additional Features

Changing Modules

Should it ever become necessary to replace or update the modules that comprise Hatfield Model Release 4.0, the Model provides a mechanism to do so.

First, copy the new modules from the updated CD-ROM or diskette into the Hatfield Model Release 4.0 Modules directory. (The default path will be *c:\program files\hm40\modules* under Windows 95 or Windows NT 4.0 and *c:\hm40\modules* under Windows NT 3.51.)

Next, select **Options** from the **HM Tools** menu. A selection box will appear which allows the working modules to be substituted. The right side of the selection box will show all the files that reside in the Modules directory. Select the new module from the list on the right, then click the appropriate button to send the module name to the appropriate box on the left. The module names listed on the left side of the form are the calculating modules used by the Model.

Hatfield Model Options

Distribution Module Name	R40_distribution.xls	<	master.xls
Feeder Module Name	R40_feeder.xls	<	R40_distribution.xls
Switching Module Name	R40_switching_io.xls	<	R40_expense_cbg.xls
Expense By Density Zone Module Name	R40_expense_density.xls	<	R40_expense_density.xls
Expense By Wirecenter Module Name	R40_expense_wirecenter.xls	<	R40_expense_wirecenter.xls
Expense By CBG Module Name	R40_expense_cbg.xls	<	R40_feeder.xls
			R40_switching_io.xls

Cancel OK

Deleting Scenario Workfiles

On certain system configurations, Hatfield Model Release 4.0 can run up against the memory limitations of Microsoft Excel 7.0. This generally happens when running very large companies with completed workfiles (i.e., running Pacific Bell subsequent to its initial run). If an *Out of Memory* error occurs when running a large company, click the **Delete Scenario Workfile** option on the **HM Tools** menu. This will delete the previously existing workfile (requiring the run to start from the *Distribution Module*), but should free up the required amount of memory.

7. Troubleshooting

Installation Problems

Hatfield Model Release 3 Workstation Prerequisites

The Hatfield Model Release 4.0 is a Visual Basic application designed to run on a Windows 95, Windows NT 3.51, or Windows NT 4.0 workstation and interface with Microsoft Excel Version 7.0. In addition to Excel, the "User Adjustable" inputs and other inputs to the application are maintained in a Microsoft Access 7.0 database that also resides on the workstation. It is not a requirement to have the MS Access software installed on the workstation, however, certain libraries must be in place for Excel to communicate with the Access database that is installed as part of the Hatfield application.

Excel must be set up to work with MS Access.

This is an optional feature that may not have been selected when Excel was installed. If this feature of Excel was not installed, the Hatfield Model application will not function properly. The most common symptom is the Distribution Module will stall and the status message "Copying Scenario Inputs ..." is displayed on the status bar. Another symptom may be a message something like "Runtime Error '424': Object Required" or another message that complains about "VBA Jet".

The most reliable way to verify that this option is installed is to rerun the Excel Setup Program and check the options listed on the Add/Remove Components form.

Another, slightly less reliable, solution is to verify the existence of a library file called "DAO3032.DLL". This solution is less reliable because the Hatfield Installation process places a copy of this file in the appropriate directory for use by the Visual Basic code. Therefore, depending on when you look for this file, (before or after the Hatfield Model Installation routine) it may be in the correct directory but still not "registered" with Excel. This file will most commonly be installed in the following platform specific directories:

Win 95: C:\Program Files\Common Files\Microsoft Shared\DAO
Win NT3.51: C:\WINNT35\MSAPPS\DAO
Win NT4.0: C:\WINNT\MSAPPS\DAO

To properly install and register this feature the Excel Setup Program must be rerun. When you get to the point where you can Add/Remove Components, Click on the Add/Remove Components button. On the next form select the Converter, Filters, Data Access option. On the next form select the Data Access option. Continue from this point by clicking the appropriate "OK", "Continue", or "Next" buttons to install this option. Once the Data Access option has been installed the errors/symptoms listed above should be resolved.

Hatfield Model Release 4.0

Inputs Portfolio

Hatfield Associates, Inc.

737 29th Street, Suite 200
Boulder, Colorado 80303

August 1, 1997

Hatfield Model Release 4.0 Inputs Portfolio

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1. OVERVIEW

This draft document contains descriptions of the user-adjustable inputs to the Hatfield Model, version 4.0 ("HM4.0"), the default values assigned to the inputs, and the rationales and supporting evidence for these default values. The inputs and assumptions in HM4.0 are based on information in publicly available documents, expert engineering judgment, or price quotes from suppliers and contractors.

Prices of telecommunications equipment and materials are notoriously difficult to obtain from manufacturers and large sales organizations. Although salespeople will occasionally provide "ballpark" prices, they will do so only informally and with the caveat that they may not be quoted and the company's identity must be concealed. It is very nearly impossible to obtain written, and hence "citable," price quotations, even for "list" prices, from vendors of equipment, cable and wire, and other items that are used in the telecommunications infrastructure. Part of the reason for this is that the vendors have long-standing relationships with the principal users of such equipment, the incumbent local exchange carriers ("ILECs"), and they apparently believe that public disclosure of any prices, list or discounted, might jeopardize these relationships. Further, they may fear retaliation by the ILECs if they were to provide pricing explicitly for use in cost models such as HM4.0.¹ The HM4.0 developers thus have often been forced to rely on informal discussions with vendor representatives and personal experience in purchasing or recommending such equipment and materials. Nevertheless, a great deal of experience and expertise in the industry underlies the estimates, where they were necessary to augment explicit, publicly-available information.

This document contains a number of graphs that illustrate a range of prices for particular kinds of telecommunications equipment. The information contained in these graphs was gathered to validate the opinions of outside plant experts who used their collective industry knowledge and experience to estimate the costs of particular items.

This document will continue to evolve as more documented sources are found to support the input values and assumptions.

Organization of Material:

Material is generally organized in this binder in the same order as default values appear in Model Input screens in the Hatfield Model.

¹ See, for example, "U S West to Suppliers: Back Us or Lose Business," *Inter@ctive Week*, September 16, 1996.

2. DISTRIBUTION

2.1 Network Interface Device (NID)

Definition: The investment in the components of the network interface device (NID), the device at the customers' premises within which the drop wire terminates, and which is the point of subscriber demarcation. The NID investment is calculated as the cost of the NID case plus the product of the protection block cost per line and the number of lines terminated.

Default Values:

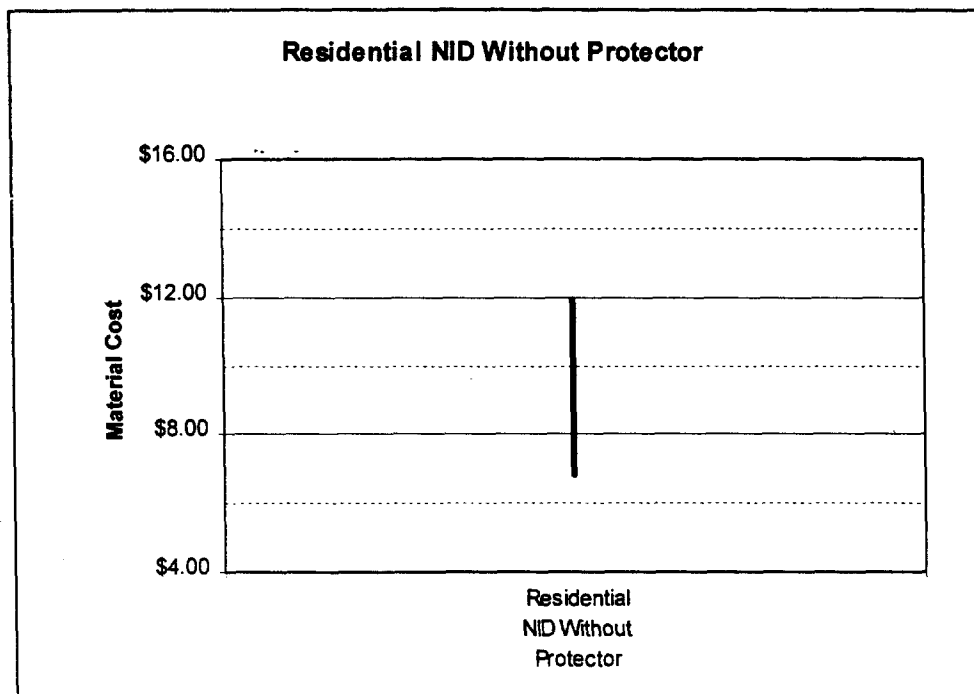
NID Materials and Installation	
	Cost
Residential NID case, no protector	\$10.00
Residential NID basic labor	<u>\$15.00</u>
Installed NID case	<i>\$25.00</i>
Maximum lines per res. NID	6
Protection block, per line	\$4.00
Business NID case, no protector	\$25.00
Business NID basic labor	<u>\$15.00</u>
Installed NID case	<i>\$40.00</i>
Protection block, per line	\$4.00

Support:

Residential NID Cost without Protector:

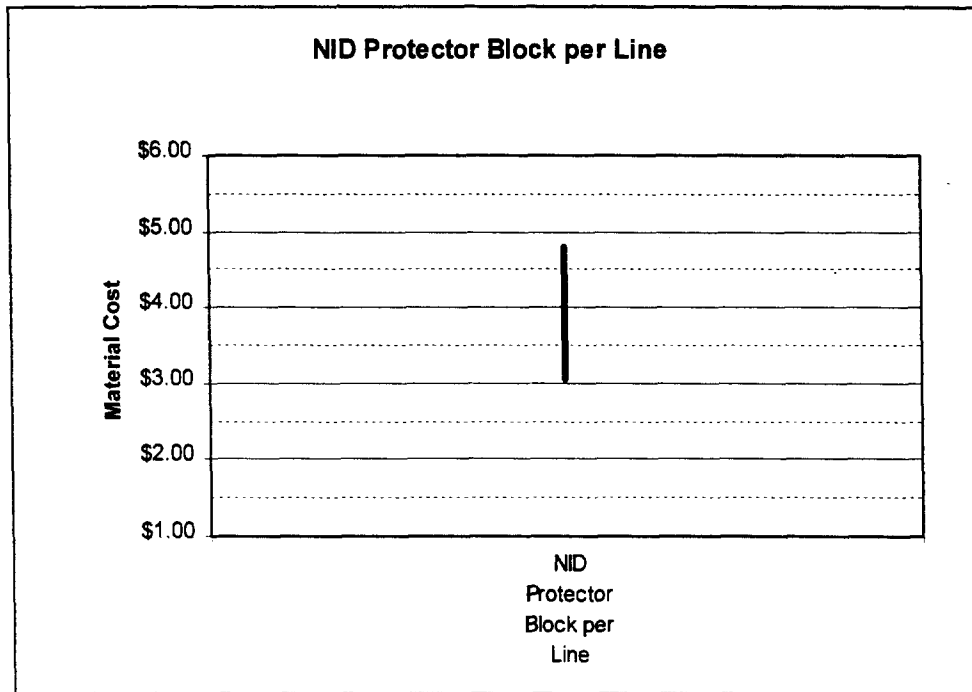
The labor estimate assumes a crew installing network interface devices throughout a neighborhood or CBG (in coordination with the installation of drops, terminals, and distribution cables). A work time of 25 minutes was used, based on the opinion of a team of outside plant experts. A loaded labor rate of \$35 per hour excludes exempt material loadings which normally include the material cost of the NID and Drops. A residential NID shell has capacity for two protectors.

Price quotes for material were received from several sources. Results were as follows:



NID Protection Block per Line:

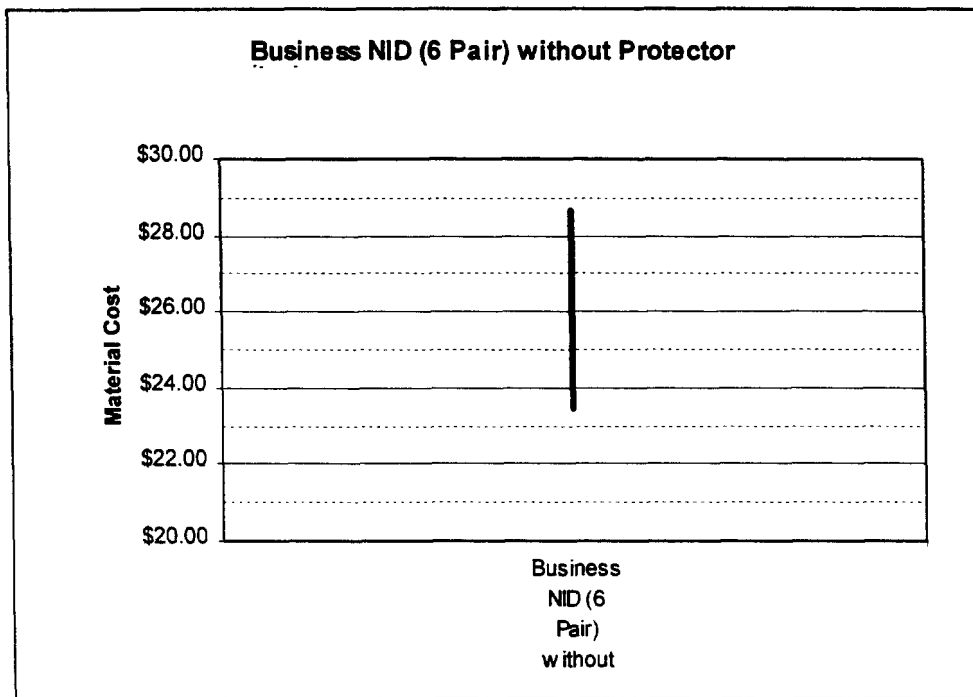
Price quotes for material were received from several sources. Results were as follows:



Business NID - No Protector:

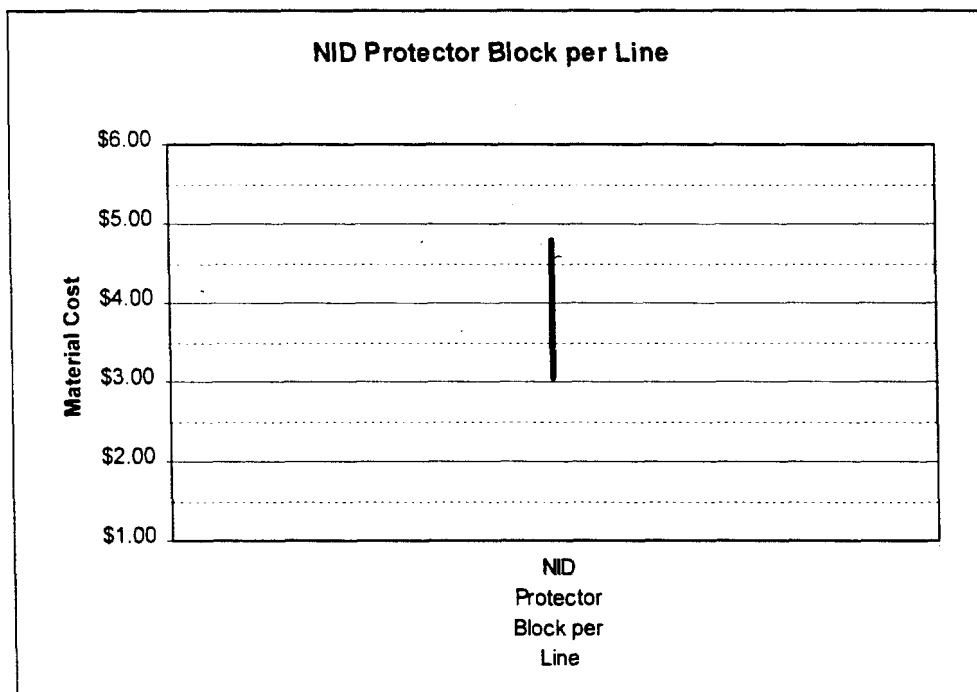
The labor estimate assumes a crew installing network interface devices throughout a neighborhood or CBG (in coordination with the installation of drops, terminals, and distribution cables). A work time of 25 minutes was used, based on the opinion of a team of outside plant experts. A loaded labor rate of \$35 per hour excludes exempt material loadings which normally include the material cost of the NID and Drops. A business NID shell has capacity for six protectors.

Price quotes for material were received from several sources. Results were as follows:



NID Protection Block per Line:

Price quotes for material were received from several sources. Results were as follows:



2.2. DROP

2.2.1. Drop Distance

Definition: A copper drop wire extends from the NID at the customer's premises to the block terminal at the distribution cable that runs along the street or the lot line. This parameter represents the average length of a drop wire in each of nine density zones.

Default Values:

Drop Distance by Density	
Density Zone	Drop Distance, feet
0-5	150
5-100	150
100-200	100
200-650	100
650-850	50
850-2,550	50
2,550-5,000	50
5,000-10,000	50
10,000+	50

Support: The Hatfield Model (HM) 4.0 assumes that drops are run from the front of the property line. House and building set-backs therefore determine drop length. Set-backs range from as low as 20 ft., in certain urban cases, to longer distances in more rural settings. While HM 4.0 assumes that lot sizes are twice as deep as they are wide, it is assumed that houses and buildings are normally placed towards the front of lots. Reasons for this include the cost of asphalt or cement driveways, unwillingness to remove snow from extremely long driveways in non-sunbelt areas, and the fact that private areas and gardens are usually situated in the backyard of a lot.

It should be noted that although exceptions to drop lengths may be observed, the model operates on average costs within density zones. The last nationwide study of actual loops produced results indicating that the average drop length is 73 feet.²

2.2.2. Drop Placement, Aerial and Buried

Definition: The total placement cost by density zone of an aerial drop wire, and the cost per foot for buried drop cable placement, respectively.

² Bellcore, *BOC Notes on the LEC Networks - 1994*, p. 12-9.

Default Values:

Drop Placement, Aerial & Buried		
Density Zone	Aerial, total	Buried, per foot
0-5	\$23.33	\$0.60
5-100	\$23.33	\$0.60
100-200	\$17.50	\$0.60
200-650	\$17.50	\$0.60
650-850	\$11.67	\$0.60
850-2,550	\$11.67	\$0.60
2,550-5,000	\$11.67	\$0.75
5,000-10,000	\$11.67	\$1.50
10,000+	\$11.67	\$5.00

Support:*Aerial Drop Placement:*

The opinions of expert outside plant engineers and estimators were used to project the amount of time necessary to attach a drop wire clamp at a utility pole, string the drop, and attach a drop wire clamp at the house or building. Labor to terminate the drop at the NID and the Block Terminal is included in the NID and Block Terminal investments respectively.

The labor estimate assumes a crew installing aerial drop wires throughout a neighborhood or CBG (in coordination with the installation of NIDs, terminals, and distribution cables), and consists of 10 minutes per drop plus 10 minutes for each 50 ft. of drop strung. The loaded labor rate excludes exempt material loadings which normally include the material cost of the Aerial Drop Wire.

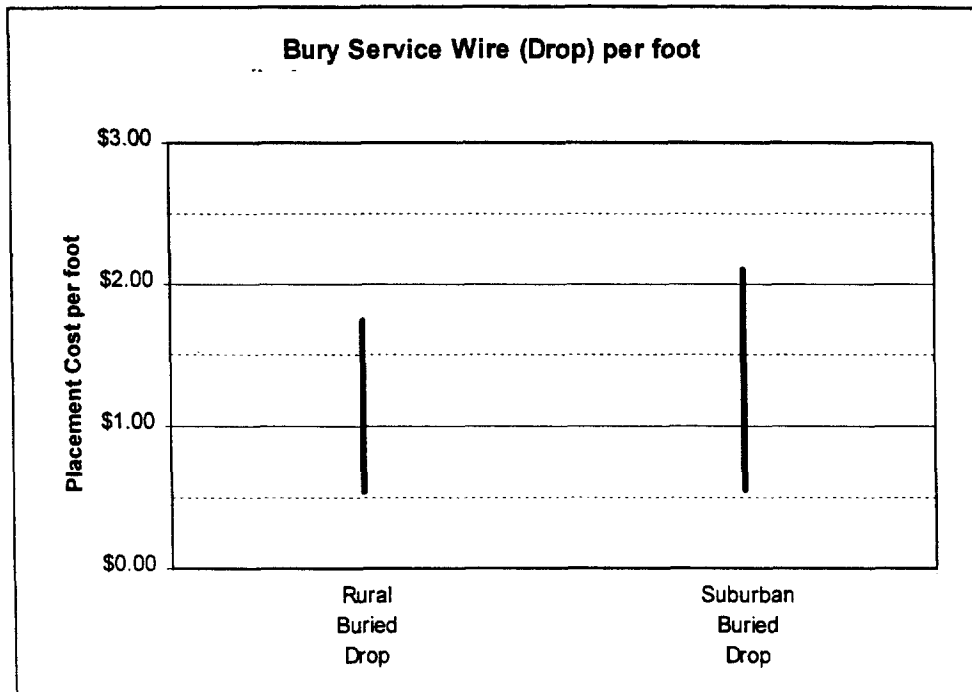
Aerial Drop Placement				
Density Zone	Aerial Drop Length (ft.)	Installation Time (min.)	Direct Loaded Labor Rate \$/hr.	Aerial Total
0-5	150	40	\$35	\$23.33
5-100	150	40	\$35	\$23.33
100-200	100	30	\$35	\$17.50
200-650	100	30	\$35	\$17.50
650-850	50	20	\$35	\$11.67
850-2,550	50	20	\$35	\$11.67
2,550-5,000	50	20	\$35	\$11.67
5,000-10,000	50	20	\$35	\$11.67
10,000+	50	20	\$35	\$11.67

Buried Drop Placement

The contract labor estimate is based on a crew installing buried drop wires throughout a neighborhood or CBG (in coordination with the installation of NIDs, terminals, and distribution cables).

Of the many quotes that were received for suburban and rural buried drop placement, several of them price buried drop placement at the HM 4.0 default values. Because buried drops are rare in urban areas, the expert opinion of outside plant experts was used in lieu of verifiable forward looking alternatives from public sources or ILECs.

Price quotes for contractor placement of buried drop wire were as follows:



Of the many price quotes received there were several at the default value. Because buried drops are rare in urban areas, the expert opinion of outside plant experts was used in lieu of verifiable forward looking alternatives from public sources or ILECs.

2.2.3. Buried Drop Sharing Fraction

Definition: The fraction of buried drop cost that is assigned to the telephone company. The other portion of the cost is borne by other utilities.

Default Values:

Buried Drop Sharing Fraction	
Density Zone	Fraction
0-5	.50
5-100	.50
100-200	.50
200-650	.50
650-850	.50
850-2,550	.50
2,550-5,000	.50
5,000-10,000	.50
10,000+	.50

Support: Drop wires in new developments are most often placed in conjunction with other utilities to achieve cost sharing advantages, and to ensure that one service provider does not cut another's facilities during the trenching or plowing operation.

Conversations with architects and builders indicate that the builder will most often provide the trench at no cost, and frequently places electric, telephone, and cable television facilities into the trench if material is delivered on site. Research done in Arizona has indicated that developers not only provide trenches, but also provide small diameter PVC conduits across front property lines to facilitate placement of wires.

The Hatfield Model version 4.0 determines the sharing of buried drop structures based on density zones. It is the judgment of outside plant experts that buried drops will normally be used with buried distribution cable. Although many cases would result in three-way sharing of such structure, a conservative approach was used at 50% sharing.

2.2.4. Aerial and Buried Drop Structure Fractions

Definition: The percentage of drops that are aerial and buried, respectively, as a function of CBG density zone.

Default Values:

Drop Structure Fractions		
Density Zone	Aerial	Buried
0-5	.25	.75
5-100	.25	.75
100-200	.25	.75
200-650	.30	.70
650-850	.30	.70
850-2,550	.30	.70
2,550-5,000	.30	.70
5,000-10,000	.60	.40
10,000+	.85	.15

Support: The Hatfield Model version 4.0 determines the use of distribution structures based on density zones. It is the judgment of outside plant experts that aerial drops will normally be used with aerial distribution cable and buried drops with buried and underground distribution cable. Therefore, the percentage of aerial drops equals the percentage of aerial distribution cable (see Section 2.5). The high percentage of aerial drops in the two most dense zones reflects the fact that such drops, if present at all, are extensions of riser cable, which is treated as aerial.

2.2.5. Average Lines per Business Location

Definition: The average number of business lines per business location, used to calculate NID and drop cost. This parameter should be set the same as 5.4.15.

Default Value:

Number of Lines per Business Location
4

Support: The number of lines per business location estimated by Hatfield Associates is based on data in the 1995 *Common Carrier Statistics* and the 1995 *Statistical Abstract of the United States*.

2.2.6. Aerial and Buried Terminal and Splice per Line

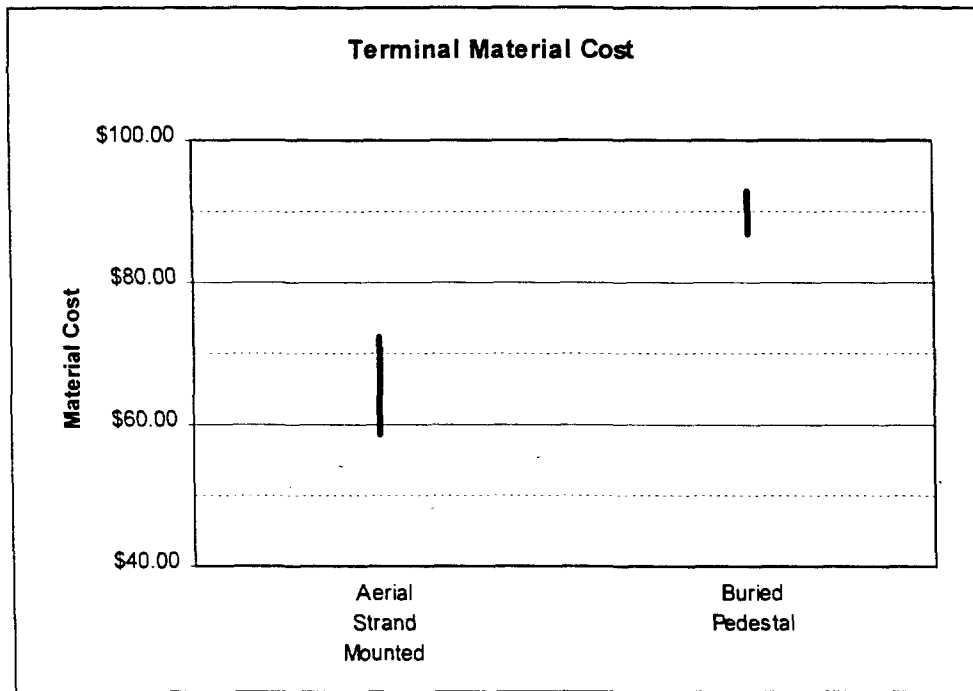
Definition: The installed cost per line for the terminal and splice that connect the drop to the distribution cable.

Default Values:

Terminal and Splice Investment per Line	
Aerial	Buried
\$32.00	\$42.50

Support: The figures above represent 25% of the cost of a terminal assuming a terminal is shared between four premises. The full cost is \$128 Aerial and \$170 Buried for both material and labor. HM 4.0 assigns this investment per line in all but the two lowest density zones, where the cost is doubled to represent two premises served per terminal.

Price quotes for just the material portion were received from several sources. Results were as follows:



2.2.7. Drop Cable Investment, per Foot and Pairs per Wire

Definition: The investment per foot required for aerial and buried drop wire, and the number of pairs in each type of drop wire.